TEST PLAN
FOR THE EVALUATION OF MULTI-MISSION DEMOLULATORS

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PREPARED BY HARRIS TECHNICAL SERVICES CORPORATION (HTSC)

Demodulator Test Plan Objective

- Demonstrate the suitability and capability of each demodulator to replace the existing Aydin/L3 Comm 2707D-930 receiver to ingest WindSat Coriolis and MetOp GDS data as well as other X-band missions. Target satellites are:

Spacecraft	Modulation	Info. Rate	Transmission Rate
– Coriolis 1:	SQPSK	2 x 12.8 Mbps	2 x 25.6 Mbps
– Coriolis 2:	SQPSK	2 x 25.6 Mbps	2 x 51.2 Mbps
– METOP:	QPSK	2 x 35 Mbps	2 x 35 Mbps
– AQUA DB/DD:	SQPSK	2 x 7.5 Mbps	2 x 7.5 Mbps
– AQUA DP:	SQPSK	2 x 75 Mbps	2 x 75 Mbps
– TERRA:	USQPSK	2 x 13.125 Mbps	13.125 Mbps I, 26.250 Mbps Q
– AURA:	TBD		
– NPP:	TBD		
– EO-1:	QPSK	2 x 52.5 Mbps	2 x 52.5 Mbps
– ICESat:	SQPSK	2 x 20 Mbps	2 x 20 Mbps
– Radarsat:	QPSK	2 x 52.5 Mbps	2 x 52.5 Mbps
– Landsat-7:	AQPSK, SQPSK	2 x 74.914 Mbps	2 x 74.914 Mbps
– JERS-1:	QPSK	2 x 30 Mbps	
– GIFTS:	TBD		

Demodulator Test Plan Objective

- 3 phase test approach:
  - In-plant tests at Harris using WindSat Coriolis data captured during Factory Compatibility Test (FCT), simulated data, and Bit Error Rate (BER) tests
  - On-site tests using simulated data and BER tests
  - On-site tests using X-Band playbacks from Coriolis and other available missions

Notes: 1) On-site tests will be coordinated with operations
2) Equipment under test will be installed in parallel with operational equipment

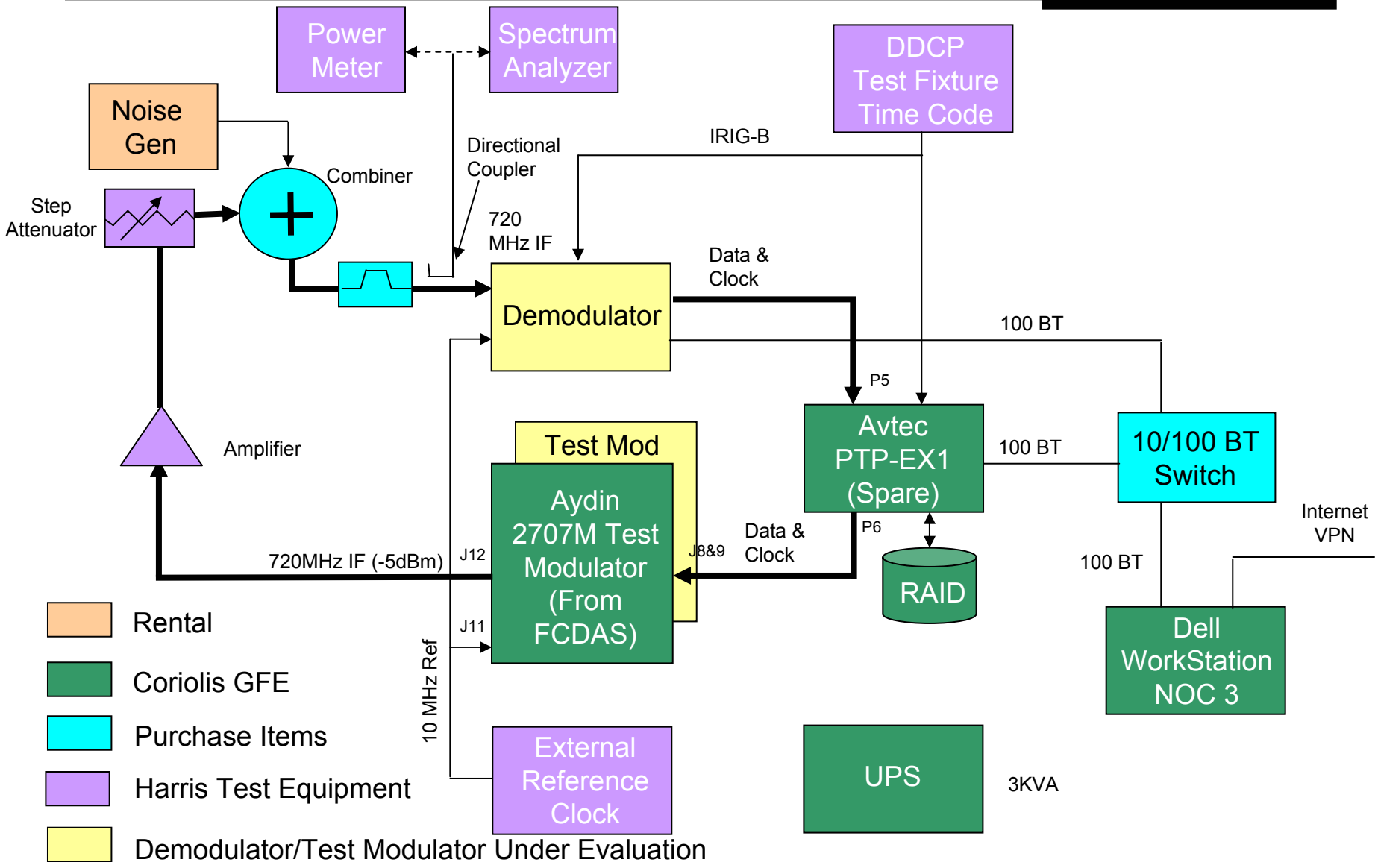
Demodulator Test Plan
Harris Laboratory Tests

- Configure demodulators in Harris lab with spare PTP-EX1 CCSDS processor and Aydin/L3 Comm 2707M test modulator (see figure on slide #6)
  - Aydin Test Modulator provides selectable modulation of external data stream and outputs S-Band (2295 MHz) and IF (720 MHz)
    - IF output will be used for this test
  - Use PTP-EX to playback and ingest previously recorded Coriolis data from FCT at 25.6 Mbps
  - Use PTP-EX to playback previously recorded Coriolis data from FCT at 51.2 Mbps
  - Use PTP-EX BER desk top and Aydin test modulator to test performance at up to 150 Mbps
  - Test using QPSK (MetOp) and SQPSK (Coriolis) modulation
  - Test other modulation types and data rates from vendor-supplied test modulators

Demodulator Test Plan
Harris Laboratory Tests

- Characterize demodulator performance by applying an external noise source at varying levels and measure resulting Eb/No
  - Eb/No vs. uncorrected BER (Pre-Viterbi FEC)
  - AGC Range (-10 to -50 dBm)
  - Carrier Acquisition range (+/- 10 KHz to +/- 1 MHz)
  - Sync Threshold $\leq$ 1 dB (Eb/No)
  - Demodulation (QPSK/MetOp, SQPSK/Coriolis)
- Evaluate TCP/IP interface for setup, control and monitoring
  - 10/100 BT switch added to connect NOC 3 to PTP and demod under test

Demodulator Test Configuration
Harris Lab



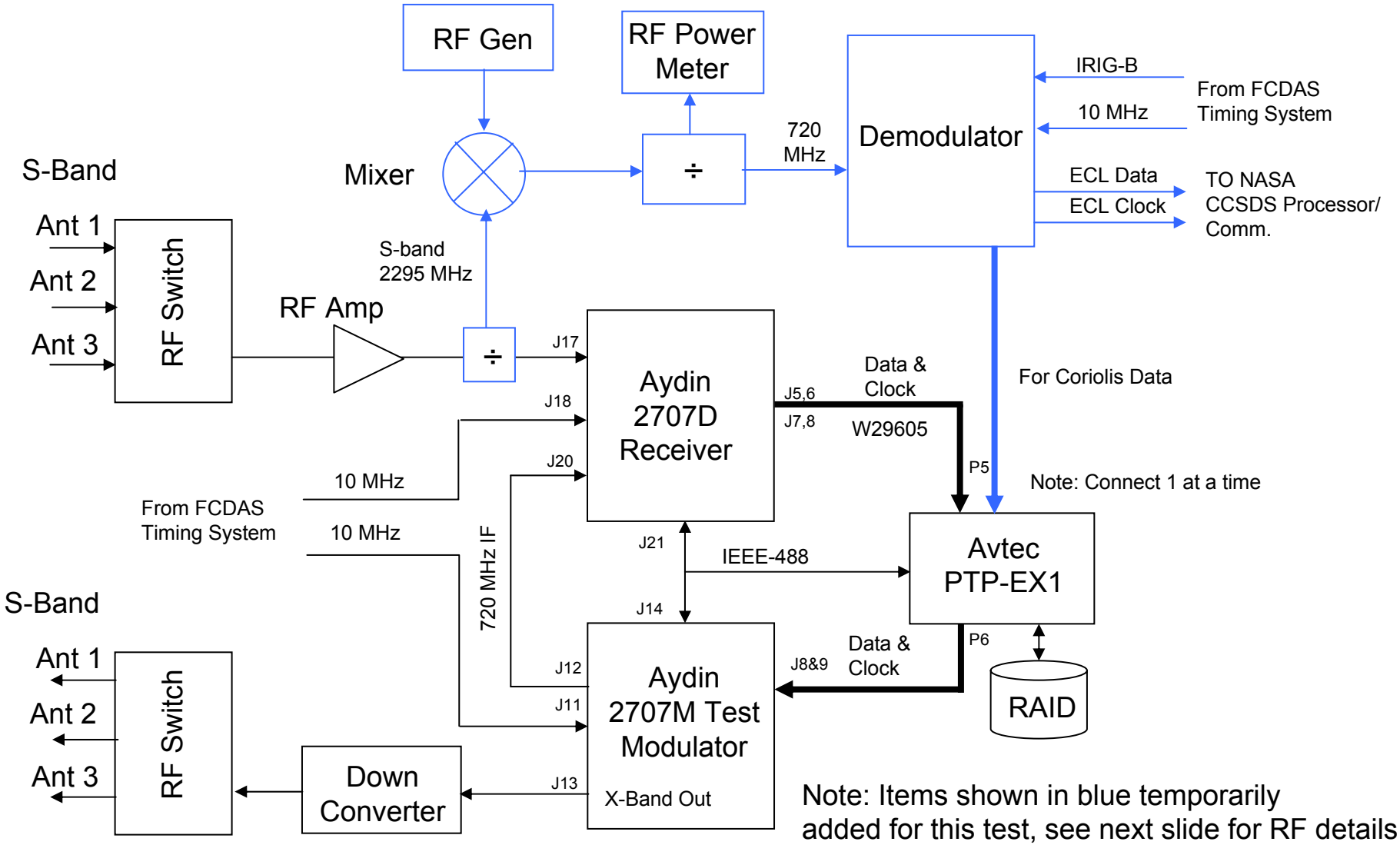
Demodulator Test Plan
On-site at FCDAS (simulated passes)

- Install demodulator under evaluation in parallel with operational Aydin/L3 Comm Receiver (see figure on slide #9)
  - Reinstall Aydin 2707M Test Modulator and verify operation
  - Install power splitter and mixer/frequency generator to route and down convert 2295 MHz S-Band to 720 MHz IF for input to the demodulator under evaluation
  - Conduct loop tests using test modulator and PTP on a non-interference basis with scheduled Coriolis contacts
    - Playback data from the PTP using desk top: FCDAS TEST.DTP
    - Test files are not sent to users
  - Measure and record receiver/RF statistics
    - BER
    - Eb/No
    - Vector analysis
    - Spectrum analysis
    - Verify that Virtual Channel files are built on the PTP without error

Demodulator Test Plan
On-site at FCDAS

- Coordinate with IPO/RSC to schedule test passes (1 week in advance)
  - Request 2 passes per demodulator (8 total)
- Configure front-end equipment to receive Coriolis data with the demodulator under evaluations and output received data to the Avtec PTP EX1.
  - Measure and record receiver/RF statistics
    - BER
    - Eb/No
    - Vector analysis
    - Spectrum analysis
  - Verify that Virtual Channel files are built on the PTP without error
- Take X-band passes for other missions (TBD) and provide data to NASA equipment for evaluation

Demodulator Test Configuration At FCDAS



Demodulator Test Plan
Post Test

- Remove Demodulators and test equipment and normalize the FCDAS ingest system
- Verify normal system operation
  - Loop test
  - Observe the ingest of several normal passes
- Prepare a test report that summarizes all test events, documents measured/observed data, and analyzes results